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Supramolecular interactions of solid human serum albumin with binary mixtures of solvent vapors

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Abstract

Sorption isotherms of organic compounds on solid human serum albumin (HSA) from binary vapor mixtures were determined by gas chromatographic headspace analysis. The shape of sorption isotherms depends on molecular structure of studied sorbates. The 'active' compounds capable to sorb effectively on dry HSA increase the sorption of 'passive' compounds unable to be sorbed by dry HSA in absence of the third component. The critical hydration of HSA is required for sorption activation of 'passive' sorbates if water is taken as 'active' component. Ethanol and acetonitrile exhibit such activation effect without threshold. 'Passive' sorbates are able to produce cooperative activation effect on the sorption of 'active' component. Hydration history effect is observed for sorption on prehydrated HSA and HSA hydrated in situ. Obtained results were interpreted in terms of clathrate formation by 'passive' sorbate (substrate) and 'active' component inside the HSA (receptor) binding centers.

Keywords: Substrate binding; Sorption cooperativity; Protein hydration; Hydration history effect; Clathrate formation

1. Introduction

Molecular interactions of proteins with organic substances as substrates with formation of 'supermolecules' are generally recognized to play important role in enzymatic reactions, transport phenomena and antigen–antibody interactions [1]. Application of organic compounds as solvents for enzymatic reactions has drawn attention to the problem of molecular interactions between organic substances and proteins in a wider aspect. Organic solvents were found to produce a number of effects on enzymatic activity and receptor properties of the protein [2–5]. Except the participation in the direct protein–solvent interactions the organic solvent may have influence on the

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